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Prevalence and determinants of poor sleep quality and depression among postpartum women: a community-based study in Ramechhap district, Nepal

Running title: poor sleep quality and depression

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Abstract

Background: Due to limited number of studies in low- and middle-income countries (LMICs), this study aimed to identify the prevalence and determinants of postpartum poor maternal sleep and depression.

Methods: This cross-sectional study was conducted with 380 women who were 2-12 months postpartum in March to April 2016 in Ramechhap district, Nepal. Multiple logistic regression was used to identify the associated factors.

Results: Prevalence of poor sleep quality and depression were 28.2% and 18.7%, respectively. Poor sleep quality was associated with having an occupation (in government or business, OR 6.69, and in agriculture/labor, OR 15.5), a male infant (OR 2.37), home delivery (OR 2.17), mental illness during pregnancy (OR 5.87), and complications after delivery (OR 5.58) as well as postpartum depression (OR 2.86). Meanwhile, postpartum depression was associated with having no postnatal care (OR 98.7), living in a nuclear family (OR 48.5), living in rural areas (OR 26.6), having a male infant (OR 4.61), having complications after delivery (OR 21.9), and introducing complementary foods before 6 months of age (OR 4.71) and having poor sleep quality (OR 3.20).

Conclusion: Relatively high prevalence of depression and poor sleep quality were found. The close positive association between poor sleep quality and depression suggests the need for early identification and support for women at-risk of poor sleep quality and depression in Nepal.

Keywords: Sleep quality, Depression, Postpartum mothers, Determinants, Nepal

Introduction

Promotion of mental health and well-being is one of the United Nation's Sustainable Development Goals.[1] Postpartum depression, one of the common mental illnesses, has serious health consequences on the quality of life of the mothers and their children.[2] It remained under-recognized and undertreated in maternal and child health (MCH) programs particularly in low- and middle-income countries (LMICs).[3]

A meta-analysis study estimated the average prevalence rate of 10-15% for non-psychotic postpartum depression.[4] In Nepal, the estimated prevalence ranged from 4.9% to 30%,[5-8] depending on study populations and methodological issues.[4] Most of the studies on postpartum depression in Nepal have been undertaken among women attending postnatal clinics at health institutions,[5, 7-9] and there are limited studies on its determinants.[8, 10] As the majority of Nepalese mothers deliver at home, there is a need for community-based studies on prevalence and its determinants in Nepal.

Poor sleep quality, a common phenomenon during the postpartum period[11] due to nighttime feeding and the frequent nocturnal awakenings of infants,[12] may be an important indicator of women's physical and mental health.[12, 13] A longitudinal population-based study in Norway showed that sleep duration decreased after childbirth and sleep problems, such as sleep onset latency, wake after sleep onset and sleep efficiency were substantially higher at week eight postpartum than at week 32 of pregnancy and at year two postpartum.[11] Insufficient and disrupted sleep after delivery was strongly associated with postnatal depression,[14, 15] while postpartum depression on the other hand might lead to disturbed sleep.[16] In addition, poor sleep quality was found to be associated with stressful life events, poor partner relationship[12, 15] and inadequate physical and emotional care for their child.[13] However, poor sleep quality is

frequently dismissed by health professionals and there is a lack of studies in LMICs, such as Nepal.

Nepal has made a substantial progress in reducing maternal mortality due to improvements in women's utilization of maternal health care services. However, access to maternal health care and provisions for maternal mental illness remain poor. Continuous efforts are needed to improve mental health as well as physical health of mothers through screening or preventive interventions for depression and poor sleep quality within maternal and child health (MCH) service. This cross-sectional study aimed to assess healthcare needs by evaluating prevalence and determinants of poor sleep quality and depression and their association among postpartum mothers in Ramechhap district, Nepal. This study also aimed to provide evidence for public health policy to manage postpartum depression and poor sleep quality among women in Nepal.

Methods

Study design and participants

This cross-sectional community-based study was conducted in Ramechhap district, Nepal in March and April 2017. Manthali municipality was purposively selected from Ramechhap district due to a lower prevalence of postnatal care (PNC) utilization compared to that of other municipalities. Four out of seven village development committees (VDCs) and mothers from each VDC were randomly selected. Mothers who had an infant and who were at least six weeks postnatal (2-12 months of child's age) were invited, while mothers who were mute, had a hearing impairment, were unwilling to participate and were migrants were excluded. Prior to undertaking the study, the study design and purpose were discussed with the community leader of each VDC and their approvals were obtained. Based on Krejcie and Morgan formula, the sample size was

estimated using a 95% confidence interval, an acceptable error of 4.4% and a sleep problems of 25%[17] and then was increased by 10% to allow for incorrectly completed questionnaires. This calculation came tothe required sample size as380. Trained researchers collected data via face to face interviews. Ethical approval was obtained from the Mahidol University Ethical Committee, and the District Health Office of Ramechhap. Study objectives were explained to the participants prior to the interviews. Participants were assured of confidentiality and were told that they could terminate participation at any time without prejudice. A consent form was read out to the mothers, and a written/verbal consent before interview was obtained. All data were treated anonymously using study identification numbers.

Measures of variables

The Pittsburgh Sleep Quality Index (PSQI) is a widely used measure that assesses clinical and subjective sleep complaints the previous month, using Likert and open-ended response formats.[18] Nineteen individual items generate 7 components including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Component scores range from 0 to 3 and are summed to obtain a global score, which ranges from 0 to 21. Higher scores indicate more sleep disturbance experienced and a global score of more than 5 indicates a significant sleep disturbance. Cronbach's alpha was 0.80 (0.83 in the original sample [18]).

Postpartum depression was assessed with the Patient Health Questionnaire-2 (PHQ-2) which performed well in primary care centers with large samples for identifying depression.[19] The two questions used to identify postpartum depression in the PHQ-2 are "Over the past 2 weeks, how often have you been bothered by any of the following problems? 1) Little interest or pleasure in doing things; 2) Feeling down, depressed or hopeless." The response options were i)

not at all, ii) several days, iii) more than half the days, and iv) nearly every day. Each question item has a score ranging from 0 to 3. The total score ranges from 0 to 6. The mothers with a score of 3 or higher as the optimal cutoff point for screening purposes were considered as depressed. All covariates were obtained by face-to-face interview.

Socio-demographic variables including maternal education and occupation, monthly family income, type of family, residence, age at last delivery, number of children under five, age of infant, sex of infant were collected by means of a questionnaire. Ante- and peri-natal factors included having mental problems like depression during pregnancy, antenatal care visits at least once, place of delivery, delivery mode, and experiencing complications of mothers or their child during pregnancy or delivery. Mental problems during pregnancy were assessed with a question, "Did you have any mental distress like depression during pregnancy?" (Response option "yes" or "no"). Experiencing complications of mothers or their child during pregnancy or delivery was assessed with a question, "Did you experience any complications during pregnancy, or delivery?" (Response option "yes" or "no"). Postnatal factors included experiencing complications of mothers or their child after delivery, postnatal care visits at least once, child still being breastfed, and timing of introducing complementary food. Experiencing complications of mothers or their child after delivery was also measured with one question, "Did you experience any complications after delivery?" (Response option "yes" or "no").

Data analysis

Descriptive statistics were used to analyze proportions or means of participants' general characteristics. Associations between dependent variables, such as poor sleep quality and depression, and other factors were assessed using Chi-square test and statistical significance was considered with p-value <0.05. Co-variates with p-value <0.05 in univariate analysis were

entered into final multiple logistic regression using stepwise method to identify predictors to the dependent variables. All analyses were conducted using the SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

General characteristics of study subjects

The mean (± Standard Deviation) age of a total of 380 mothers at the last delivery was 30 years (± 3.9), within a range of 19 to 42 years and that of their children was 6.2 months (± 3.2). About two thirds of mothers lived in rural areas, in a joint/extended family and had no formal education or had primary education level and with a monthly family income of 30,000 rupees or less (approximately 288 US dollars or less) (Table 1). Mothers with a history of mental illness during pregnancy such as depression was 13.7% and those with complications before and after delivery were 22.4% and 28.2%, respectively. The rates of poor sleep quality and depression in postpartum were 28.2% and 18.7%, respectively.

In univariate associations in Table 1, mothers with poor sleep quality were more likely to be illiterate, to be involved in agriculture/labor work, to have a low monthly family income, to reside in rural areas, to be at age 30 or higher at the last delivery, and to have 2 or more children and a male infant ($p<0.05$). For the ante- and post-natal factors, they were more likely to have mental illness such as depression during pregnancy and maternal and infant medical complications after delivery, but less likely to have antenatal care (ANC) and PNC visits and institutional delivery. Meanwhile, mothers with postpartum depression were more likely to be involved in agriculture/labour work, to live in a nuclear family and in rural areas and to have a male infant. For the ante- and post-natal factors, they were less likely to have ANC and PNC

visits, and institutional delivery, but more likely to have maternal or infant medical complications after delivery and to introduce complementary food before babies were 6 months of age.

Table 2 shows that the mean score of sleep quality was statistically significantly higher in those who were depressed than those who were not ($p<0.0001$). Among the seven subcomponents, whereas the duration of sleep and sleep disturbance were not associated with postpartum depression, the other five subcomponents of sleep quality such as sleep quality, sleep latency, sleep efficiency, sleep medications, and daytime dysfunction were strongly associated with postpartum depression.

The factors associated with poor sleep quality as shown in Table 3, were mother's occupations of government or business (OR=6.69, 95% CI=1.93-23.2) and of agriculture/labor (OR=15.5, 95% CI=5.10-47.2), having a male infant (OR=2.37, 95% CI=1.29-4.33), home delivery (OR=2.17, 95 % CI=1.20-3.93), mental illness during pregnancy (OR=5.87, 95% CI=2.72-12.7), medical complications of mother or baby after delivery (OR=5.58, 95 % CI=2.64-11.8), and postpartum depression (OR=2.86, 95% CI=1.49-5.49).

In Table 4, factors associated with postpartum depression were living in a nuclear family (OR=48.5, 95% CI=15.3-154) and in rural areas (OR=26.6, 95% CI=5.34-132), having a male infant (OR=4.61, 95% CI=1.84-11.5), no PNC visit (OR=98.7, 95% CI=19.4-503), experiencing complications after delivery (OR=21.9, 95% CI=7.30-65.9), early introduction of complementary foods before 6 months of age (OR=4.71, 95% CI=1.88-11.8) and poor sleep quality in the postpartum period (OR=3.20, 95% CI=1.34-7.61).

Discussion

This cross-sectional community-based study aimed to assess the prevalence and determinants of poor maternal sleep and depression among postpartum women in Ramechhap district, Nepal. This study showed that among the 380 postpartum women surveyed, about 28% of them had poor sleep quality and 19% experienced postpartum depression. Factors positively associated with poor sleep quality were working mothers, having a male infant, home delivery, mental illness during pregnancy, experiencing medical complications after delivery and postpartum depression. Living in a nuclear family, living in rural areas, having a male infant and postnatal complications, no PNC visits, early introduction of complementary foods before 6 months of age and postpartum poor sleep quality were positively associated with postpartum depression. This study showed that depression and poor sleep quality are closely interrelated among the postpartum mothers. Healthcare professionals should be aware of the high prevalence of postpartum poor sleep quality and depression and their associations, and should not overlook their symptoms among postpartum women. This study highlights the need to develop a comprehensive public health policy to ensure that improvement of self- and social awareness, universal psychosocial assessment and active social support for postnatal women, particularly disadvantaged women and those living in rural areas are undertaken within maternal and child health programs in Nepal.

Prevalence of poor sleep quality and depression

Prevalence of poor sleep quality was relatively lower (28%) among 380 mothers at 2-12 months postpartum in this study, compared to other studies in other countries. Other studies assessed sleep quality among mothers who delivered in health facilities just after delivery in Taiwan (87.5%)[12] or at postpartum 2-4 months in Iran (53%),[14] and in Norway (58%),[15] when newborn care requires frequent nighttime wakening due to more often nighttime feedings by 3 to

4 months. It can be explained partly due to this study investigating postpartum women including those more than 6 months postpartum, despite the use of the same measurement tool.

This study showed that 18.7% of 380 women had postpartum depression at 2-12 months postpartum in communities of Ramechhap district using PHD-2, which is a well-studied screening measure of depression and is often used in primary care.[19] Compared to other Nepalese studies, despite the use of the different measure using the Edinburgh Postnatal Depression Scale (EPDS) at cutoff ≥13, the prevalence ranged from 3.9%,[5] 17% [9] to 30%[7] from hospital-based studies, and from 3.9%[5] to 12.3%[6] from community-based studies. The incidence using the same criteria were 19.4 % at 6 week and 22.2 % at 10 weeks postpartum in a hospital in Kathmandu, Nepal. The differences in prevalence of postpartum depression among Nepalese postpartum women could be due to variations in methodological design[4] and diverse ethnicity, as Nepal is a country with great diversity in terms of economy, geography, culture, and ethnicity.[5]

Associations between poor sleep quality and depression

This study confirms previous findings[14-16, 20] that depression and poor sleep quality are closely interrelated among the postpartum mothers. The associations between depression and poor sleep quality have been studied using cross-sectional design[14, 15] and case-control design.[16, 20] A case-control study among Norwegian women at 2 months postpartum reported no difference between women with depression and those without depression when measuring sleep quality with objective actigraphy or sleep diary.[20] Another matched case-control study among 44 women who were six to 26 weeks postpartum in Philadelphia showed that women with depression had poorer sleep quality, based on objective measures using wrist actigraphy, than those without depression and that there was a positive linear association between poor sleep quality and depression symptom severity.[16] Despite limited findings on the association between sleep

disturbance and depressive symptoms during this period, many studies noted that those with postpartum depression seemed more likely to experience more waking after sleep onset, and more nighttime demands.[16] On the other hand, women who had poor sleep quality in the postpartum period had increased odds of depression.[14] Our study showed that whereas the duration of sleep and sleep disturbance were not associated with postpartum depression, the other five subcomponents of sleep quality such as sleep quality, latency and efficiency, and sleep medications and daytime dysfunction were strongly associated with postpartum depression. Further, this study supports that maternal and infant medical complications after delivery and a history of antenatal or postnatal mental illness (e.g. depression) may be associated with an increased likelihood of poor sleep quality. Studies[15, 21] have shown that the strongest determinants of postpartum depression were psychological distress during the previous year. Familial support for nighttime infant care and receiving education of effective sleep strategies from health professionals should be planned to reduce both sleep problems and depression, particularly when mothers have depression.[16]

Other determinants of poor sleep quality

This study found that delivering babies at home was a determinant of poor sleep quality. In Nepal, the majority of women in rural areas deliver at home due to preference and perception towards home delivery[22] as well as barriers of high financial cost both in accessing health services and delivering at the facilities.[23] It is also supported by our study showing that the positive association of poor sleep quality with mothers having agriculture/labor occupations who mostly resided in rural areas. Home deliveries are also common even in urban area, where maternity services are relatively easily accessible.[22] The same as those in agriculture/labor occupations, those working in government or business tend to return to work within a short time

after childbirth, exposing them to additional job-related stress and eliminating the opportunity for napping during the day. Moreover, after work, working Nepalese mothers handle domestic tasks, such as childcare and household chores unless husbands help with these tasks. Having a child might well contribute to sleep deprivation of the mothers, due to higher levels of household work and childcare, increased fatigue, and decreased sleep efficiency particularly in a country like Nepal, where resources are limited. As this study may support that women who were in lower socioeconomic backgrounds were more likely to have poor sleep quality,[24] health professionals should provide effective strategies to help solve sleep problems within the MCH programs, particularly for deprived women. Further, having a male infant was inversely associated with sleep quality, consistent with other studies,[13, 15] probably due to infants being temperamental difficult.[13] Although those with cesarean sections were reported to have poorer sleep quality than those with normal delivery in a study,[25] our finding did not show significant associations between poor sleep quality and delivery mode or timing of introducing complementary food.

Other determinants of postpartum depression

It is interesting to note that those living in a nuclear family were strongly associated with having postpartum depression in Nepal, where the rapid nuclearization of families is occurring. In Nepalese culture, the practical support, such as taking care of children from women's mothers and mothers in-law during the postpartum period is important. Support from a woman's own mother to her daughter on practical and emotional issues after childbirth would be limited to the first several weeks particularly in a nuclear family. Moreover, it may be more difficult to deal with if a postpartum woman experienced both medical complications of her own or of her baby after delivery and poor sleep quality, which are strongly associated with postpartum depression.[14, 15]

Findings from our study indicated that antenatal depression, and maternal and infant complications and poor sleep quality after delivery can be predictive of postpartum depression. In addition, those residing in rural areas and receiving no PNC had a higher likelihood of depression in this study. In Nepal, high proportions of women lack access to PNC or make fewer than the recommended visits. Generally, health institutions are inaccessible to the majority who live in rural areas and to those who cannot pay for PNC. As the risk of depression increases over the postpartum period, with peaks documented through 6 months,[26] screening should be integrated into routine practice and repeated either during mothers' postpartum visits[27] or during infants' well-child visits[26] up to at least 6-months postpartum. Special attentions should be paid to mothers living in rural areas and disadvantageous mothers through outreach and to train local lay people to provide support. It may require considered efforts to improve the uptake of PNC visits and also the provision of effective and practical guidelines within PNC, including provisions to care for maternal physical and mental illnesses after childbirth and for associated parenting difficulties such as infant feeding practices and infant sleep problems. Our study found that having a male infant was associated with depression as seen in a Norwegian study,[15] while other studies showed that depression was higher in mothers of girls in India,[28] and in Iran.[29] As the association between a child's sex and postpartum depression has not been elucidated yet, further studies could be conducted.

Strengths and limitations

The study has certain limitations which should be noted when interpreting the findings of this study. Firstly, as our findings came from a cross-sectional survey with a small sample, we cannot establish causality. Secondly, there can be a concern on measurement tools as data collection was undertaken by single-question, short-term, self-reported assessments that can

contribute to measurement errors and imprecise estimates due to reliance on women's memory. Therefore, the results may be subject to recall bias and reduced accuracy compared to objective measures of sleep. Given the limitations, the use of a community-based sample can be advantageous as it permitted more precise estimation of prevalence of poor sleep quality and depression at a community level.

Conclusions

This cross-sectional study of 380 women in Ramechhap district, Nepal revealed 28% of the women had poor sleep quality and 19% experienced postpartum depression. There was a close positive association between poor sleep quality and depression among women at 2-12 months postpartum. The findings suggest that supporting mental health of mothers ought to be highlighted in the maternal and child health program with specific efforts to identify depression and poor sleep quality early on and to provide effective and tailored care from pregnancy to postpartum.

Author's contributions: SAH and RK contributed in the conception of the work; RK supervised data collection. SAH and RK analyzed the data and drafted the manuscript. SAH and Y-SC critically revised the manuscript for intellectual content. All authors read and approved the final manuscript.

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Ethical approval: Before commencement of the study, ethical approval was granted from the Mahidol University Ethics Committee and the District Health Office of Ramechhap. The protocol was explained in detail in the local language to women and informed consent was obtained from all individual participants included in the study. All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Table 1. Bivariate association between depression and status of sleep quality and covariates

	Total	Poor sleep quality		p-value	Depression		p-value
		Yes (> 5)	No (≤ 5)		Yes (≥3)	No (<3)	
	n (%)	n (%)	n (%)		n (%)	n (%)	
Sociodemographic factors							
Education							
Illiterate	134 (35.3)	50 (46.7)	84 (30.8)	**0.0137**	29 (40.9)	105 (34.0)	0.0733
Primary	105 (27.6)	24 (22.4)	81 (29.7)		24 (33.8)	81 (26.2)	
Secondary or above	141 (37.1)	33 (30.8)	108 (39.6)		18 (25.4)	123 (39.8)	
Occupation							
Agriculture/labor	199 (52.4)	87 (81.3)	112 (41.0)	**<0.0001**	55 (77.5)	144 (46.6)	**<0.0001**
Government/Private/business/tour	97 (25.5)	16 (15.0)	81 (29.7)		4 (5.6)	93 (30.1)	
Housewife	84 (22.1)	4 (3.7)	80 (29.3)		12 (16.9)	72 (23.3)	
Monthly family income (>30,000 rs [1)])	140 (36.8)	26 (24.3)	114 (41.8)	**0.0015**	24 (33.8)	116 (37.5)	0.5560
Type of family (Nuclear family)	126 (33.2)	39 (36.5)	87 (31.9)	0.3936	34 (47.9)	92 (29.8)	**0.0035**
Residence (rural)	258 (67.9)	89 (83.2)	169 (61.9)	**0.0098**	69 (97.2)	189 (61.2)	**<0.0001**
Age at last delivery (≥ 30)	233 (61.3)	75 (70.1)	158 (57.9)	**0.0278**	39 (54.9)	194 (62.8)	0.2205
No. of children under five (2+)	277 (72.9)	89 (83.2)	188 (68.9)	**0.0048**	55 (77.5)	222 (71.8)	0.3367
Sex of newborn (boys)	191 (50.3)	68 (63.6)	123 (45.1)	**0.0012**	54 (76.1)	137 (44.3)	**<0.0001**
Age of newborn (2-6 months)	165 (43.4)	39 (36.5)	126 (46.2)	0.0860	31 (43.7)	134 (43.4)	0.9638
Ante- and peri-natal factors							
Mental illness(depression) during pregnancy (yes)	52 (13.7)	28 (26.2)	24 (8.8)	**<0.0001**	13 (18.3)	39 (12.6)	0.2085
Antenatal care visits (at least once)	179 (47.1)	41 (38.3)	138 (50.6)	**0.0317**	24 (33.8)	155 (50.2)	**0.0128**
Place of delivery (Home)	131 (34.5)	55 (51.4)	76 (27.8)	**<0.0001**	43 (60.6)	88 (28.5)	**<0.0001**
Delivery mode (Vaginal)	336 (88.4)	95 (88.8)	241 (88.3)	0.8896	67 (94.4)	269 (87.1)	0.0825
Complications during pregnancy/delivery (yes)	85 (22.4)	33 (30.8)	74 (27.1)	0.4666	14 (19.7)	71 (23.0)	0.5523
Postnatal factors							
Complications after delivery (yes)	107 (28.2)	14 (13.1)	71 (26.0)	**0.0065**	36 (50.7)	71 (23.0)	**<0.0001**
Postnatal care visits (at least once)	108 (28.4)	23 (21.5)	85 (31.1)	**0.0609**	6 (8.5)	102 (33.0)	**<0.0001**
Still being breastfed (yes)	285 (75.0)	82 (76.6)	203 (74.4)	0.6448	48 (67.6)	237 (76.7)	0.1106
Timing of complementary food (<6 months)	285 (75.0)	77 (72.0)	208 (76.2)	0.3920	34 (47.9)	251 (81.2)	**<0.0001**
Poor sleep quality (yes)	107 (28.2)	-	-	-	44 (62.0)	94 (30.4)	**<0.0001**
Depression (yes)	71 (18.7)	44 (41.1)	27 (9.9)	**<0.0001**	-	-	-

1) 1 US dollar = 102.5 rupee

Table 2. Sleep quality for women at 2-12 months postpartum with depression status

	Total	Depression		p-value
		Yes (3+)	No (<3)	
	Mean (SD)	Mean (SD)	Mean (SD)	
Sleep quality				
Total score (0-21)	4.09 (2.37)	5.89 (2.79)	3.68 (2.06)	**<0.0001**
7 Components				
Sleep quality (0-3)	1.21 (0.62)	**1.61** (0.52)	1.11 (0.60)	**<0.0001**
Sleep latency (0-3)	0.80 (0.61)	**1.15** (0.73)	0.72 (0.55)	**<0.0001**
Sleep duration (0-3)	0.57 (0.60)	0.48 (0.50)	0.60 (0.62)	0.0952
Sleep efficiency (0-3)	0.19 (0.42)	**0.30** (0.49)	0.17 (0.39)	**0.0491**
Sleep disturbances (0-3)	0.72 (0.47)	0.80 (0.40)	0.71 (0.48)	0.1120
Sleep medications (0-3)	0.41 (0.66)	**0.97** (0.86)	0.28 (0.53)	**<0.0001**
Daytime dysfunction (0-3)	0.19 (0.41)	**0.58** (0.50)	0.10 (0.33)	**<0.0001**

Table 3. Determinants of poor sleep quality among the mothers at 2-12 months postpartum

	Poor sleep quality	
	OR	(95% CI)
Occupation		
Agriculture/labor	**15.5**	**(5.10- 47.2)**
Government/Private/business/tour	**6.69**	**(1.93- 23.2)**
Housewife	1.00	
Sex of infant		
Girl	1.00	
Boy	**2.37**	**(1.29- 4.33)**
Place of delivery		
Home	**2.17**	**(1.20- 3.93)**
Health facilities	1.00	
Mental illness like depression during pregnancy		
No	1.00	
Yes	**5.87**	**(2.72- 12.7)**
Complications after delivery		
No	1.00	
Yes	**5.58**	**(2.64- 11.8)**
Postpartum depression		
No	1.00	
Yes	**2.86**	**(1.49- 5.49)**

Table 4. Determinants of depression among the mothers at 2-12 months postpartum

	Depression		
	OR	(95% CI)	
Type of family			
Nuclear	**48.5**	**(15.3-**	**154)**
Joint/extended	1.00		
Residence			
Urban	1.00		
Rural	**26.6**	**(5.34-**	**132)**
Sex of infant			
Girl	1.00		
Boy	**4.61**	**(1.84-**	**11.5)**
Postnatal care visits (at least once)			
No	**98.7**	**(19.4-**	**503)**
Yes	1.00		
Complications after delivery			
No	1.00		
Yes	**21.9**	**(7.30-**	**65.9)**
Timing of complementary food			
<6 months	**4.71**	**(1.88-**	**11.8)**
≥ 6 months	1.00		
Poor sleep quality			
No	1.00		
Yes	**3.20**	**(1.34-**	**7.61)**